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## **Modelling 3D product visualization on the online retailer**

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# Modelling 3d Product Visualization on The Online Retailer

## Abstract:

**-Purpose:** An emerging body of research has investigated telepresence and presence notions in online retailers' websites during the past two decades. Since that time considerable research has been published in different fields to explain the meanings and applications of these notions. This study aims to investigate the antecedents and consequences of 3D product simulation telepresence and the effects of the consequences on consumers' behavioural intentions on the online retailer Website.

**-Design/methodology/approach:** this study developed a retailer Website in which a variety of laptops are presented by using 3D product visualizations. This research used a within-subjects design and employed two laboratory experiments. In the first experiment, a two-way repeated measure ANOVA was conducted to determine the effects of the manipulated conditions on the dependent variable (i.e., 3D telepresence). Finally, we used Amos 16 to test the overall goodness of fit of the proposed conceptual model.

**-Originality/values:** To the best of the authors' knowledge, this research is the first in the UK that used a UK sample to investigate the effects of using 3D product visualization in an electrical industry (i.e., laptops) on consumers' experiences. Secondly, this paper merged constructs from the human-computer-interaction (HCI) field (i.e., control, vividness and telepresence) to the proposed model. Moreover, the way this paper defines interactivity and telepresence adds value to this study. Thirdly, we developed new scales to measure telepresence and control constructs to suit consumers' experience in the online retailer context. Finally, the design of this study is original in using a website that contains 3D product visualization with both utilitarian and hedonic values.

**-Findings:** The manipulation checks showed that high control and animation provides most effective representation of telepresence. The overall goodness of fit of the conceptual model met the standards and showed that all the hypothesized paths were valid.

**-Key words:** control; animation; telepresence; values and behavioural intention.

**-Paper type:** Research paper.

## **1.0 Introduction:**

Previous research on telepresence (e.g., Biocca, 1997; Sheridan 1992; Heeter, 1992; Lombard and Ditton, 1997) reveals that researchers from different fields (communication, business, psychology, and human-computer-interaction) used different terms (i.e., presence, telepresence, virtual presence, immersion, and mediated presence) to describe the same concept. Previous research (e.g., Biocca, 1992; Steuer, 1992; Sheridan, 1992) has focused on presence/ telepresence notions to explain the virtual reality experience. However, the way that previous researchers developed their understanding of presence/ telepresence depended on the level of technology that they used.

Even though interactivity and vividness have been identified as the main antecedents of telepresence (e.g., Suh and Lee, 2005; Suh and Chang 2006; Fortin and Dholakia, 2005), there is a great deal of debate about defining and operationalizing telepresence and interactivity constructs. This paper reviews previous studies in telepresence and re-defines antecedents and definitions to suit the context of the online retailer and consumers' virtual experience.

## **2.0 Theoretical background**

In the online retail context, telepresence has been discussed based on users' ability to be transported into another place by using 3D product simulation. For example, some authors reported the significance of 3D in enhancing a product simulation experience (Li et al., 2002). The influence of 3D on consumers' experience has been empirically tested by many scholars. For example, Li et al. (2002), Suh and Lee (2005), Hopkins, Raymond and Mitra (2004) and Suh and Chang (2006) who found that 3D product simulations (the best user interface that can enhance telepresence) has direct influences on product knowledge, product attitude, brand attitudes and purchase intention.

Interactivity and vividness have been identified as the main determinants of telepresence (Li et al., 2003; Suh and Lee, 2005; Hopkins et al., 2004). However, there is little agreement on defining and conceptualizing interactivity. Considerable research has investigated and empirically tested the notion of interactivity. For example, Steuer (1992) classified interactivity into three elements; speed, mapping and range. Rafaeli (1988), Rafaeli and Sudweeks (1997) stated that interactivity is more related to the communication process. Ariely (2000) defined interactivity based on the control construct (the narrowest definition of

interactivity). On the other hand, other scholars (e.g., Downes and McMillan, 2000; McMillan, 2002; McMillan and Hwang, 2002; Lui and Shrum, 2002) argued that defining interactivity should not be restricted to messages, human interactions or communications. Rather, the definition should include multidimensional aspects. The above scholars defined speed, responsiveness and communications as the main antecedents of interactivity.

Since Heeter (2000, p. 75) described interactivity as “*an overused and underdefined concept*”. This research defines control as users’ ability to customize and choose the contents of the virtual model (i.e., 3D product visualization), users’ ability to change colours, rotate, zoom in/out the product in the virtual model and the ability of the virtual model (3D) to respond to participants’ orders properly. This research focuses on vividness of the visual imagery, where consumers can see online products with different colours (skins) just as they can see it in an offline retailer. We considered animation to represent vividness. Finally, we defined telepresence as a psychological state in which virtual objects presented in 3D in a computer-mediated environment are perceived as actual objects in a sensory way. We hypothesize that control and animation are the main antecedents for telepresence.

Based on the previous research on telepresence area we identified hedonic and utilitarian values as the main consequences of telepresence (Fiore et al., 2005a; Fiore et al., 2005b). Finally, we hypothesize that hedonic and utilitarian values (produced from telepresence) enhance consumers’ responses (i.e., behavioural intentions) towards the online retailer. This result has been supported by previous scholarly literature in the online virtual experience (Lee et al., 2006). (For the hypotheses illustration, see figure 2 below).

### **3.0 Methods**

#### **3.1 Stimuli**

A retailer’s website with a single stimulus was custom-designed for this study. The stimulus illustrates products in 3D visualizations such that participants can see the laptops from different angles; can rotate it, and zoom in/out. The 3D stimulus is designed to help consumers to imagine the product in appropriate and relevant ways and enhances virtual experiences (Li et al., 2001).

### **3.2 Interface design**

Four 3D flashes (sites) were designed for the 3D product visualizations. The first flash contained a laptop that participants can zoom in/out, rotate, change the colour and get information (i.e., features and attributes). The second flash has a laptop that participants can zoom in/out rotate and change the colour but with only limited information about the external appearance of the laptop (i.e., participants can only close and open the laptop). The third flash has a laptop that participants can only zoom in/out and rotate, but they cannot change the laptop colour. The final simulation illustrates a laptop that participants can do nothing with, which keeps rotating in front of the participants. The above 3D sites, particularly the flash that contained information differed from the previous research that has reported the significant role of 3D in enhancing fun and enjoyment only, whereas we also include utilitarian values (e.g., Schlosser, 2003; Fiore et al., 2005b; Lee et al., 2006; Kim and Forsythe, 2007).

### **3.3 Experimental Design**

The Website was designed especially for this study and therefore was not known to the users and users also did not know the fictitious brands at the site. Thus, any impact of participants' previous experiences or attitudes was avoided (Fiore et al., 2005a). The site offers a wide variety of laptops that are similar to those that college-aged women and men are buying and using. Thus, the site is suitable for use with the sample, which consisted of university students. One experiment was performed, as outlined below:

The first experiment illustrates the importance of different levels of control and animation, and their impact on perceived telepresence. In designing the first experiment, we manipulated two constructs each with two levels (i.e., high and low): 2 levels of control  $\times$  2 levels of animation (i.e., colour). Participants performed the first experiment. We employed 312 participants and used Amos 16 to test the hypotheses in the proposed conceptual model to measure the overall goodness of fit of it.

## 4.0 Results

Figure 1 the mean and standard deviation for the four manipulated conditions (experiment 1)

Condition	Mean	Std. Deviation	N
High control, high animation	19.5833	3.54985	24
High control, Low animation	14.4167	4.49073	24
Low control, High animation	13.2500	3.54168	24
Low control, Low animation	10.0833	3.74069	24

A two-way repeated measures ANOVA was conducted to compare scores on two levels of control and two levels of animation (2control  $\times$  2animation) using authenticity as the dependent variable. The result shows a significant effect of the control variable, Wilks' Lambda: (0.275)  $F(1, 23) = 60.778$ ,  $P < .001$ , eta squared value = .725 (a large effect size i.e., .14 or more, Cohen, 1988) mean and standard error of control levels ( $M_{\text{high}}=17$ ,  $SE_{\text{high}}=.551$ ,  $M_{\text{low}}=11.7$ ,  $SE_{\text{low}}=.68$ ). A significant effect of animation variable Wilks' Lambda: (0.40),  $F(1, 23) = 34.6$ ,  $P < .001$ , eta squared value = .60 (a large effect size) mean and standard error of animation levels ( $M_{\text{high}}=16.42$ ,  $SE_{\text{high}}=.54$ ,  $M_{\text{low}}=12.3$ ,  $SE_{\text{low}}=.704$ ). A non-significant effect of the interaction between the two variables (control\*animation) was found  $F(1, 23) = 2.272$ ,  $P > .05$ , eta squared value = .090 (a moderate effect). Participants exposed to the condition with high control and high animation significantly agreed that the site had a high level authenticity ( $M = 19.5833$ ,  $SD=3.54985$ ). The same participants significantly agreed that the site with low levels of control and animation had a low level of authenticity (Mean = 10.1,  $SD=3.47$ ). See figure 1 above for the remaining two conditions.

The adequacy of the hypotheses was assessed by using Chi-square test, CFI, RMSEA and RMR to test the overall goodness of fit of the proposed conceptual model. The composite reliabilities of telepresnce and control, were 0.88 0.81 respectively.

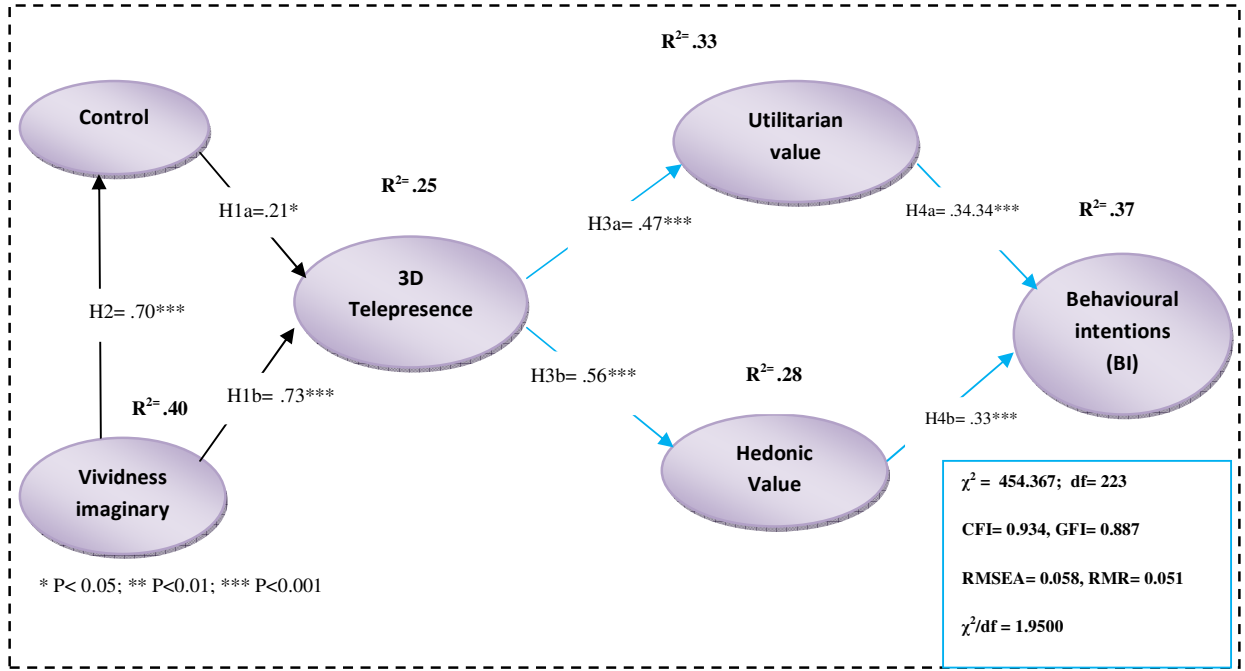


Figure 2: conceptual framework, hypotheses and results.

The structural equation model fitted the data with a chi-square of 454.367 ( $df = 223$ ), goodness of fit index (GFI) of .887, comparative fit index (CFI) of .934, root mean square residual (RMR) of .051 (Byrne, 2001; Hair et al., 1998). All hypotheses were statistically supported ( $P < .05$ ). Control and animation had significant positive effects on telepresence ( $H1a$ :  $t = 2.426$ ;  $H1b$ :  $t = 6.069$ ). Moreover, animation exhibited a significant positive effect on control ( $H2$ :  $t = 6.738$ ). As we hypothesized, telepresence revealed significant positive effects on hedonic and utilitarian values ( $H3a$ :  $t = 8.852$ ;  $H3b$ :  $t = 7.537$ ). Finally, hedonic and utilitarian values exhibited significant positive effects on behavioural intention ( $H4a$ :  $t = 3.3$ ,  $H4b$ :  $t = 2.16$ ).

## 5.0 Discussion, recommendation and limitation

The generalisability of the findings is limited by the student sample. Nevertheless, students are a useful sample, representing the shoppers of tomorrow ((Balabanis and Reynolds, 2001)). In the light of the debate, among scholars, about telepresence and presence, this research highlights the lack of consensus about telepresence and its measurement scales. The scale that was developed by this research to measure telepresence construct is suitable and convenient for academics and practitioners who are interested in understanding the role of 3D in simulating real products in the online retail context. In other words, the previous scales that

measured telepresence focused on the illusion or the ability of being transported into another place. However, this new scale focuses on the authenticity of images and the ability to imagine a virtual object as real one.

Relevant to the debate among previous scholars concerning interactivity definitions, we found that control provides the best representation of interactivity of 3D virtual models on an online retailer's site.

Results of this research support past research that reported 3D ability to provide customers with more information and fun (e.g., Fiore et al., 2005a; 2005b). Moreover, the way we designed the 3D flashes and the authenticity of the flashes in simulating a real laptop give this research more validity in providing consumers with more information. However, as a result of focusing on telepresence construct as illusion or being there, previous research has focused on the importance of the experiential value that consumers can gain from navigating 3D products over that of the instrumental value (e.g., Schlosser, 2003; Fiore et al., 2005b; Lee, et al., 2005; Kim and Forsythe, 2007). Based on the results of the present study, we recommend Website developers to pay more attention to adding more information while developing 3D flashes. We recommend future researchers to examine the generalisability of the findings to other contexts and samples.

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